p255
Q16
175g of lead at 327ºC into 55g of water.

a) Q=mH = 0.175x20040=3507.0
3507=mc(Tf-Ti)
Tf = (3507/(0.055x4180))+20=35.2545
35ºC

a) $-mc(T_E-T_i) = mc(T_E-T_i)$
$-0.175(130)(T_E-327)=0.055x4180x(T_E-35)$
0.175x130=22.75 22.75x327=7,439.25

0.055x4180=229.9 229.9x35=8,046.5

$-22.75T_E+7439.25 = 229.9T_E - 8046.5$

229.9+22.75=252.65 7439.25+8046.5= 15485.75
$T_E =$ 15485.75/252.65=61.2933
61ºC

mH-mc(Tf-Ti) = mc(Tf-Ti) alternate equation

Quiz next class
Laws of Thermodynamics:

Zeroith Law
Heat flows from hot objects to cold objects until thermal equilibrium (same temperature).

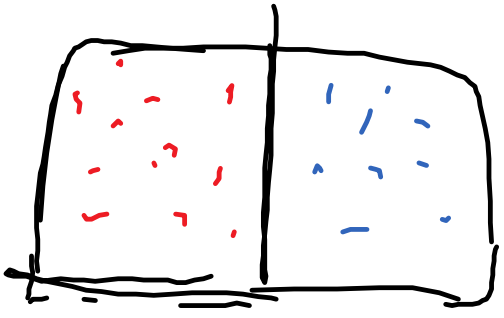
First Law
The internal energy, U, of the system changes with heat, Q, and work done, W, on the system.
$\Delta U = Q + W$

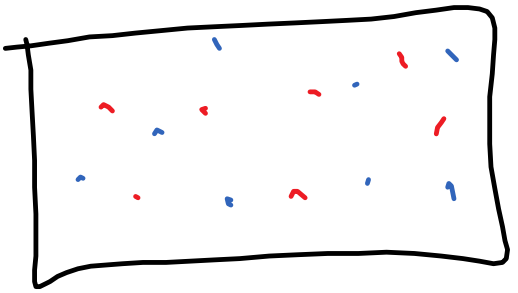
essentially an early statement of the law of conservation of energy.

Second Law
Entropy (quantity of randomness) increases in a system unless work is done on the system. Total entropy of the universe tends to increase.

eg. your bedroom gets messy unless you clean.

classic example:
a container with hot gas on one side and cold gas on the other. If you remove the barrier, they mix and are less structured.





eg. A 50.0 g lead bullet is moving at 500.0 m/s when it hits a steel barrier and stops.

a) what is the kinetic energy of the bullet?

$=1/2\ mv^2$ 0.5x0.05x500x500=6,250.0
6.25kJ

a) how much energy is required to heat the bullet from 20.0ºC to 327ºC? c=130J/kgK

Q=mcΔT= 0.050x130x(327-20)=1,995.5 J

Hf=2400J/kg

a) How much energy is needed to melt the bullet?

Q=mH = 0.05x20400=1020.0 J

a) If all the kinetic energy is transformed into heat, what will be the final temperature of the bullet? (no heat lost to the steel plate or air)

6250-1020-1995.5=3234.5
Q=mcΔT
ΔT = 3234.5/(0.05x130)=497.6154
Tf = 497.6+327=824.6
825ºC

2. Why is there order on Earth given the second law of thermodynamics?

Heat from the sun powers the mechanisms by which order arises out of disorder.

3. How does a refrigerator work?

4. Gas Laws $PV=nRT$
   P is pressure in kPa (Pa if V is in m^3)
   V is volume in litres
   n is the number of moles, 6.02×10^{23} molecules/mole
   R is constant 8.314 LkPa/molK or J/molK
   $Pa = N/m^2$ $L = 0.001\ m^3$ $Pa \times m^3 = Nm = J$

   $W=Fd = P\Delta V$
   T is temperature in **Kelvin!!!!!!**

   If you have 1.0 L of gas at 101kPa at 20ºC and it expands to 2.0L at the same pressure, what is the new temperature?